

IN THE CLAIMS:

Please add new claims 32 and 33 as follows:



1-24. (Cancelled)

25. (Currently amended) A positive electrode – electrolyte – negative electrode-assembly for a solid oxide fuel cell (SOFC PEN) with a cathode, said cathode comprising a porous cathode layer and an active cathode layer, with an anode, said anode comprising three distinct continuous layers, each of these ~~three~~ layers forming a single, continuous structure, said anode layers comprising an active anode layer ~~and an anode support layer, and an anode collector layer~~, said anode support layer constituting the mechanical support of the PEN, and with at least one electrolyte layer, said electrolyte layer being placed between said active anode and cathode layers, wherein said ~~anode comprises an anode collector layer, which~~ covers the rear face of the anode support layer, and ~~in that~~ wherein the anode collector layer presents, on its rear face which is designed to come into contact with an interconnecting plate, a raised structure which is chosen so as to form gas circulation channels with said interconnecting plate.

26. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the cathode also has, on its rear face which is designed to come into contact with an interconnecting plate, a raised structure which is chosen so as to form gas circulation channels with said interconnecting plate, and in that the raised structures of the anode and of the cathode each comprise a plurality of prominent bumps which are spaced apart from one

another, wherein summit surfaces of the bumps of the anode are substantially coplanar and parallel to summit surfaces of the bumps of the cathode, the latter likewise being coplanar with one another.

27. (Previously presented) The SOFC PEN as claimed in claim 26, comprising at least one first hole and at least one second hole passing axially through it, in that the raised structure of the rear face of the anode comprises at least one first lip that surrounds said first hole, and in that the raised structure of the rear face of the cathode comprises at least one second lip that surrounds said second hole, said first hole not being surrounded by a said second lip and said second hole not being surrounded by a said first lip.

28. (Previously presented) The SOFC PEN as claimed in claim 27, wherein the raised structures of the respective rear faces of the cathode and anode each comprise an edging that surrounds each rear face, each capable of forming, in collaboration with an interconnecting plate, a chamber that is sealed except on an open portion of said edging.

29. (Previously presented) The SOFC PEN as claimed in claim 27, comprising at least four axial holes and in that the raised structures of the rear faces of the anode and cathode each have an edging that respectively surrounds said rear faces, and at least one inlet hole and one outlet hole for each of the fuel and oxidizing gases respectively.

30. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the front face of the anode on the electrolyte side also has a raised structure.

31. (Previously presented) The SOFC PEN as claimed in claim 30, wherein the anode support layer has a raised structure on its front face, in that the active anode layer has a thickness of 1-20 μm , the electrolyte has a thickness of 3-20 μm and the active cathode layer has a thickness of 1-20 μm , wherein said active anode layer, the electrolyte and active cathode layer cover said raised structure of said front face, and in that the raised structure of said front face of the anode support layer is chosen so that the rear face of the cathode can form gas circulation channels with an interconnecting plate with which it comes into contact.

32. (Previously presented) The SOFC PEN as claimed in claim 31, wherein the structure of the front face of the anode support layer is obtained by a molding process and in that the thin layers are obtained by a deposition process.

33. (Previously presented) The SOFC PEN as claimed in claim 31, wherein said raised structure of the front face of the anode comprises a plurality of bumps having a height of between 0.2 and 2 mm, and in that the distance between the flanks of neighboring bumps is between 0.1 and 2 mm.

34. (Previously presented) The SOFC PEN as claimed in claim 30, wherein the anode support layer has an anterior raised structure on its front face, in that the active anode layer,

the electrolyte and the active cathode layer consist of thin layers, and in that the porous cathode layer has, on its rear face which is designed to come into contact with an interconnecting plate, a raised structure which is chosen so as to form gas circulation channels with said interconnecting plate.

35. (Previously presented) The SOFC PEN as claimed in claim 34, wherein said anterior raised structure of the front face of the anode support layer is obtained by stamping.

36. (Previously presented) The SOFC PEN as claimed in claim 34, wherein said anterior raised structure of the front face of the anode support layer is obtained by a micromolding process.

37. (Previously presented) The SOFC PEN as claimed in claim 36, wherein said anterior raised structure of the front face of the anode support layer is obtained by micromolding and gelling.

38. (Previously presented) The SOFC PEN as claimed in claim 34, wherein the height of the raised elements of said anterior raised structure is between 0.1 and 2 mm and in that the distance between neighboring elements is between 50 μm and 2 mm.

39. (Previously presented) The SOFC PEN as claimed in claim 30, wherein the ratio between the height and the thickness of the elements of the raised structure of the front face of the anode is between 1 and 4.

40. (Previously presented) The SOFC PEN as claimed in claim 30, wherein the anode is obtained by joining a smooth rear face of the anode support layer to a smooth front face of the anode collector layer.

41. (Previously presented) The SOFC PEN as claimed in claim 30, wherein the raised structures of the front faces and/or rear faces of the anode and cathode are obtained by molding.

42. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the material of the anode support layer and/or anode collector layer comprises fibers selected from ceramic fibers and metal fibers.

43. (Previously presented) The SOFC PEN as claimed in claim 42, wherein the proportion of said fibers is from 20 to 40% by volume, and in particular from 25 to 35% with respect to the total volume.

44. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the material of the porous cathode layer comprises fibers selected from ceramic fibers.

45. (Previously presented) The SOFC PEN as claimed in claim 42, wherein the diameter (d) of said fibers is between 1 and 50 μm and the a ratio L/d , wherein L stands for the length of the fibers, is between 2 and 30.

46. (Previously presented) The SOFC PEN as claimed in claim 44, wherein a diameter (d) of said fibers is between 1 and 50 μm and a ratio L/d , wherein L stands for the length of the fibers, is between 2 and 30.

47. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the material of the anode support layer and/or anode collector layer comprises a reforming catalyst selected from Ni deposited on ceramic particles, NiCu deposited on ceramic particles, chromites, CeO_2 , and mixtures thereof.

48. (Previously presented) The SOFC PEN as claimed claim 47, wherein the amount of catalyst is between 5 and 15% by volume of the material of the anode.

49. (Previously presented) An SOFC stack, comprising a plurality of PENs as claimed in claim 27 and interconnecting plates, in an alternating manner, wherein each of said

interconnecting plates is a smooth and planar plate provided with holes that are coincident with the holes of the PENs, as seen in the stacking axis.

50. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the front face of the anode on the electrolyte side also comprises raised structures, wherein the raised structures of the front faces and/or rear faces of the anode and cathode are obtained by micromolding and gelling.

51. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the material of the porous cathode layer comprises fibers selected from strontium-doped lanthanum manganate (LSM) fibers, strontium-doped lanthanum cobaltate (LSC) fibers and lanthanum ferrocobaltates.

52. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the material of the anode support layer and/or anode collector layer comprises fibers selected from ceramic fibers and metal fibers, and wherein the diameter (d) of said fibers is between 2 and 30 μm and a ratio L/d , where L stands for the length of the fibers, is between 5 and 25.

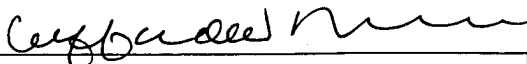
53. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the material of the anode support layer and/or anode collector layer comprises fibers selected from ceramic fibers and metal fibers, and wherein the diameter (d) of said fibers is between 5 and 15 μm and a ratio L/d , where L stands for the length of the fibers, is between 8 and 20.

54. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the material of the porous cathode layer comprises fibers selected from ceramic fibers, and wherein the diameter (d) of said fibers is between 2 and 30 μm and a ratio L/d , where L stands for the length of the fibers, is between 5 and 25.

55. (Previously presented) The SOFC PEN as claimed in claim 25, wherein the material of the porous cathode layer comprises fibers selected from ceramic fibers, and wherein the diameter (d) of said fibers is between 5 and 15 μm and a ratio L/d , where L stands for the length of the fibers, is between 8 and 20.

56. (Previously presented) The SOFC SOFC PEN as claimed in claim 25, wherein the front face of the anode on the electrolyte side also comprises raised structures, wherein the raised structures of the front faces and/or rear faces of the anode and cathode are obtained by stamping.

Respectfully submitted,

By: 
Clifford W. Browning
Reg. No. 32,201
Krieg DeVault LLP
One Indiana Square, Suite 2800
Indianapolis, IN 46204
(317) 238-6203